

A COMPUTER VISION TOMATO PEST ASSESSMENT AND PREDICTION TOOL - 1ST AFRICANLP WORKSHOP, INTERNATIONAL CONFERENCE ON LEARNING REPRESENTATIONS (ICLR 2020)

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IDRC Grant/ Subvention du CRDI: 108914-001-Building a network of excellence in artificial intelligence in Sub-Saharan Africa

A Computer Vision Tomato Pest Assessment and Prediction Tool

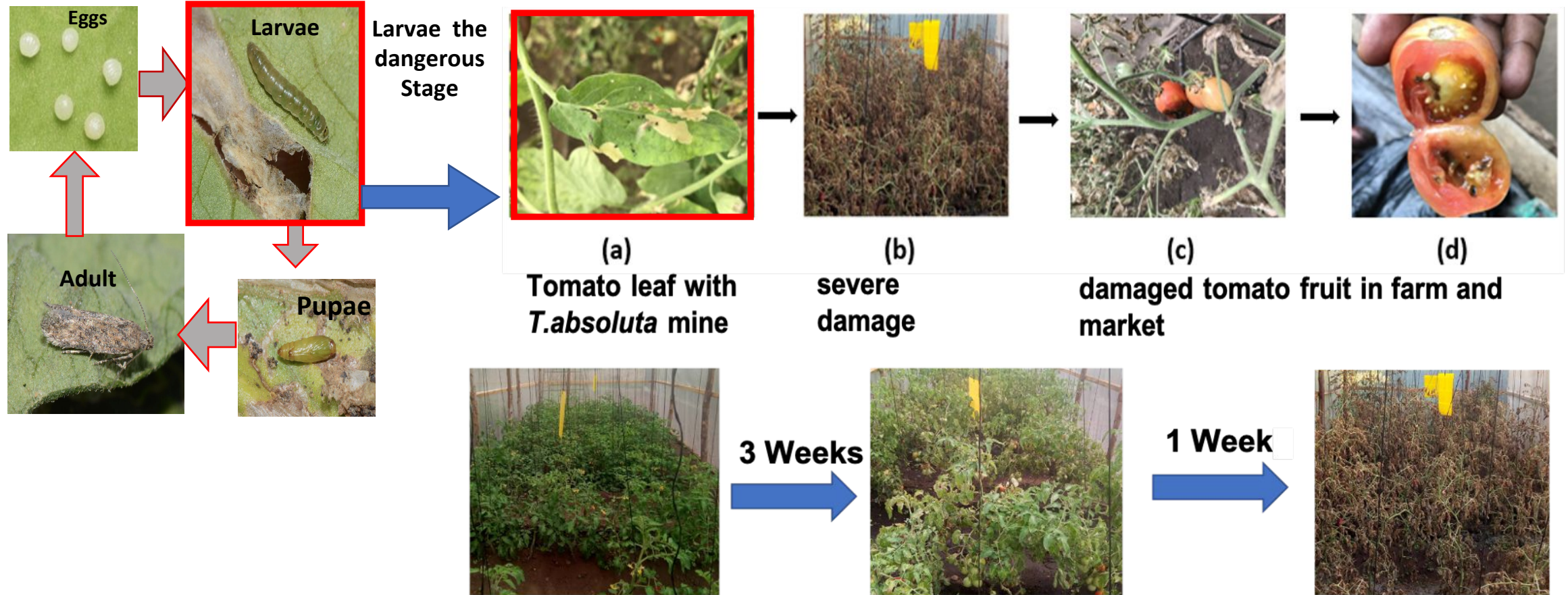
ICLR - AfNLP Workshop

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Tuta absoluta a threat

Tomato pest *Tuta absoluta* is a threat to tomato farmers across the world



An **early detection** and **quantification** solution using Computer vision

Data collection

Factors considered

- **Season** – dry, wet, dry/wet
- **Location** – 2 regions
- **Variety** – commonly grown
- **Farming system**

Table 1: Data collection set-up and factors considered for each experiment					
duration	season	region	variety	farming system	images
Aug - Nov 2018	dry	north	1	drip, furrow, bund	2248
Jan - May 2018	dry	north	3	drip	2012
Oct - Dec 2019	dry/wet	north	3	drip	4060
Jan - Apr 2020	wet	east	2	drip, furrow, bund	2916

In-house facility



In-house experiment layout in Arusha 12M X 12M X 4.5 M (LWH) Net house (0.1cm net size). Drip irrigation, Furrow irrigation and Bunds.



In-house experiment layout in Morogoro 15M X 12M X 5 M (LWH) Net house (0.1cm net size). Drip irrigation, Furrow irrigation and Bunds.

Data collection

Transplanting seedling
in in-house field



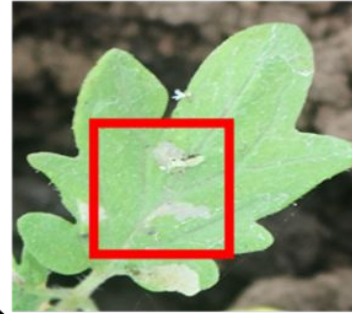
Inoculate *Tuta absoluta*
On second day



Capture image before and
after transplanting for 2
weeks



2nd Day



4th Day



7th Day



NoTuta



low



high

24/09/2019



26/09/2019



29/09/2019



01/10/2019



BLK1_PL003

BLK1_PL026

BLK2_PL010

BLK2_PL084

BLK3_PL49

BLK3_PL052

BLK3_PL094

Fig. Different tomato plant images at different dates

Results

	VGG16			VGG19			ResNet50			Inception-V3		
Severity	PRC	RCL	FI-S	PRC	RCL	FI-S	PRC	RCL	FI-S	PRC	RCL	FI-S
No Tuta	0.877	0.965	0.918	0.883	0.918	0.918	0.878	0.900	0.890	0.895	0.933	0.915
Low Tuta	0.760	0.355	0.448	0.708	0.538	0.595	0.500	0.445	0.470	0.660	0.518	0.575
High Tuta	0.905	0.940	0.920	0.905	0.948	0.920	0.903	0.910	0.905	0.915	0.930	0.923
Average Accuracy	0.871			0.783			0.837			0.872		
Loss	0.152			0.258			0.334			0.205		

PRC - Precision, RCL - Recall, F1-S - F1-score

- Inception-V3 outperforms all other models
- **No tuta** and **High tuta** easily detected

Future works

- T.Absoluta localization - Instance segmentation
- For quantification

Affected tomato



Tomato mask



Tomato segment



Tuta absoluta segments



Project Team



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SUPPORT

